State of Montana
Department of Transportation
Rail, Transit & Planning Division

Highway Economic Analysis Tool, ver. 2

Statement of Work

Version: *CEP Final*

Date: 4/23/13

Version	Date	Author	Description of Change
1.0	8/31/12	Project Team	Initial draft
2.0	3/13/13	John Kimball	Changes to content and format
3.0	3/21/13	John Kimball	Changes to content and format
4.0	3/22/13	John Kimball	Changes to content and format
5.0	4/01/13	John Kimball	Final updates prior to submittal with CEP
6.0	4/23/13	John Kimball	CEP Final - removed 'DRAFT' watermark

Table of Contents

1.0 Introduction

1.1 Project Title

Highway Economic Analysis Tool, version 2 (HEAT2)

This Statement of Work (SOW) is made and entered by and between the Montana Department of Transportation (MDT) and [*Contractor*]. This SOW incorporates by reference the terms and conditions of Contract Number [*XXX-XXX-XXX*] in effect between the State and [*Contractor*]. In case of any conflict between this SOW and the Contract, the Contract shall prevail. The Agency and Contractor agree as follows:

1.2 Background

During the early 2000's the MDT conducted multiple studies on the economic effects of highway improvement scenarios. The main objective was to develop a sophisticated methodology to compare and analyze the relative economic benefits of transportation investments. Cambridge Systematics developed a Geographic Information Systems (GIS) based system that automated the process of economic analysis utilizing Esri's ArcGIS Desktop Software, with interfaces to legacy ArcView version 3.3, as well as the Regional Economic Models Inc. (REMI) Software and Microsoft Excel.

HEAT was designed to automate economic impact analysis. It provides a graphical user interface (gui) and a series of functions and tools focused at guiding the user through typical and repeatable steps to analyze and model the economic impact of highway improvement scenarios. This allows the user to quantify the costs and benefits associated with potential improvements.

HEAT was originally written in Avenue for Esri's ArcView 3.x and partially updated to Microsoft Visual Basic for Applications (VBA) as macro to the ArcGIS Desktop environment. Avenue has long been deprecated and recently VBA has been deprecated by Microsoft. With the release of ArcGIS version 10 in 2010, Esri has officially deprecated VBA and macros are no longer available in the product without additional configuration. Esri's ArcGIS Desktop has moved to the Add-in model similar to other Windows based products such as Microsoft Office or Mozilla Firefox. Add-ins cannot be coded within the desktop software itself, instead requiring the use of an Integrated Development Environment (IDE) where the modules are coded, built and then deployed to the software. ArcGIS Server now shows the potential to complete all processing, allowing users to interact with the program through a web interface and significantly reduce software dependencies.

The applications of HEAT2 are multiple:

- Long-Range Policy Plan Updates
    - Corridor-level analysis
- Investment Analysis
    - Investment strategy

  - Packages of reconstruction work that add capacity
- District Nomination Process
  - Screen and rank projects
- Fire-Year Tentative Construction Program (TCP) development
- Project implementation for EIS (Environmental Impact Statement) evaluation
- An extensible design to accommodate changes in federal highway programs.

The broad goals of HEAT2 can be summed up in the following points:

- Identify which transportation investments will benefit specific Montana industries.
- Provide MDT with an analytical toolbox to evaluate economic development impacts of transportation improvements.
- Apply the analytical toolbox to quantify the impacts of transportation improvement scenarios as part of MDT's planning process.
- Provide an extensible system design so that HEAT2 can be modified by changing or adding features to meet future highway program performance requirements such as Map21.

1.3 Project Goal

The goal of this project is to deploy a new version of HEAT which includes an update of the design and programming while maintaining the original functionality of HEAT. This new version (HEAT2) will be compatible with current versions of software noted below. The HEAT2 design will be extensible and sufficiently flexible to meet changing Federal, State and Agency requirements.

1.4 Agency Goals and Project Objectives

The Agency goals and project objectives of this project are as follows:

Agency Goals	Project Objectives
Complete the coding of the modules compatible with current software version of REMI, Microsoft Excel, and Esri ArcGIS.	Deploy a working version of HEAT2 compatible with the current version ArcGIS Software and outputs to be compatible with the current version ArcGIS for Desktop. Geoprocessing and ArcObjects functionality will be performed with current version of ArcGIS for Server, or alternatively Desktop. Numeric outputs from HEAT2 will be provided in formats usable in current version of Microsoft Excel. The interfaces to the REMI program will be capable

Agency Goals	Project Objectives
	of executing with the current version. The application will be flexible to updates in ArcGIS, Microsoft Office, and REMI software
Economic modeling capability of HEAT2 is maintained from the initial version of the program.	Maintain the current modeling capabilities of the original HEAT without significantly altering the algorithms that process the data. Make that processing happen in the current software versions and with dynamic data sources from internal MDT systems.
Utilize dynamic data sources such as roadway and traffic information from MDT's internal Oracle databases.	Provide a method for the end user to reconstruct the roadway network based upon the dynamic data sources. Provide the user with a configuration that allows them to alter where maintained data sources reside, such as in an ArcSDE database.
The Cost Estimation module of HEAT2 utilizes MDT's Project Estimation Tool (PET).	Utilize the PET spreadsheet in the model processing; provide a façade wrapper or similar solution to provide a service for cost estimation to be consumed by the HEAT2 program. The purpose of the service to allow changes to happen to PET and allow another estimation tool to be connected to HEAT2 when the PET reaches end-of-life and is replaced.
Provide the user with a simple user interface for scenario creation and editing on a map. Allow the user to interact with the outputs of the HEAT2 program in the same or similar interface.	Allow users to easily create and attribute new roadways for improvement scenarios such as realignments, also allow user to attribute improvement scenarios on existing roadways. This can be achieved either in the ArcGIS for Desktop program or through a web browser, preferably a standard web browser, such as IE 8+.

Agency Goals	Project Objectives
Develop a robust scenario management tool.	Preserve completed HEAT2 improvement scenarios, their parameters, inputs and output indefinitely. Allow the end user to select from previously created scenario and use that as the basis for a new HEAT2 scenario.
Create a simple user-interface for end users to interact with the HEAT2 program.	Provide the user a model parameter dialogue that allows them to change key model parameters. Provide a dialogue that allows the users to select which HEAT2 modules to process. Provide an email notification to the user when the model has completed processing. Attempt to process the entire model from start to finish in less than one hour.
Source code of HEAT2 to be open allowing other transportation agencies to collaborate with and benefit from the program.	Provide access to the code through internal and external source control, such as SVN internally and GitHub externally.
Design must be extensible to accommodate future changes to federal, state and agency requirements.	Provide a system design that can be modified by changing or adding features to meet future highway program requirements.

1.5 Required Technical Skill Set

The technical skill set required to complete this project varies based on the user-interface technology used in the client-side application, as well as the ArcObjects framework (.net, C++, or Java) used to interact with the ArcGIS products.

The following skills are required, no matter which technology stack is utilized:

- ✓ PL/SQL
- ✓ Oracle
- ✓ Word

- ✓ Excel
- ✓ Outlook
- ✓ SVN (Subversion)

Depending on the solution architecture the following skill sets may be necessary:

- ✓ ArcObjects
- ✓ ArcGIS
- ✓ REMI
- ✓ Python
- ✓ VB .Net
- ✓ ASP .Net
- ✓ Java
- ✓ JSP
- ✓ C++
- ✓ JavaScript
- ✓ HTML
- ✓ CSS

1.6 Reference to other applicable documents

- Montana Highway Configuration Study
- HEAT, version 1 business background
- HEAT version1 User Guide
- HEAT2 SOW (CEP draft)
- HEAT2 Requirements Document
- Esri's HEAT2 System Design Recommendations

2.0 Staffing Roles and Responsibilities

2.1 Staffing

Project Manager – Contractor

Role/Responsibility: Is the single point of contact for the contractor, provides project oversight, submits Contractor change requests, invoices and requests for decisions, provides bi-weekly status reports, and coordinates contractor resources and a participant on the project Change Board.

The Contractor's Project Manager is:

Name: <TBD>

Address:

City:

State & Zip

Phone:

Cell:

Fax:

Email:

Project Manager – Agency

Role/Responsibility: Is the single point of contact for the Agency; provides Agency project; he ensures project control processes are followed; has overall accountability for project coordination. Daily coordination of agency resources will be managed by the lead business SME and project sponsor. The Agency PM partners with the project sponsor for approval of deliverables and milestones and invoice processing. The PM also facilitates the change board meetings.

The Agency's Project Manager is:

Name: John Kimball

Agency: Montana Department of Transportation, Information Systems Division

Address: 2701 Prospect Ave.

City: Helena

State & Zip: Montana, 59601

Phone: 406-444-9824

Email: jkimball@mt.gov

Project Sponsor / Contract Manager – Agency

Role/Responsibility: Provides information on present and future Agency goals, manages the project budget, facilitates availability of Agency resources and partners with the Project Manager in managing the contract, and deliverable, milestone, and invoice approvals. Participates in the project change board and has final signature approval on change orders.

Name: Doug McBroom, Multimodal Programs, Bureau Chief

Agency: Montana Department of Transportation, Rail, Transit & Planning Division

Address: 2701 Prospect Ave.

City: Helena

State & Zip: Montana, 59620-1001

Phone: 406-444-7289

Email: dmcbroom@mt.gov

2.2 Roles and Responsibilities Matrix

Contractor Staff, Roles and Responsibilities

<The Contractor will complete this portion. >

- *Identify the Contractor staff that will be involved, their titles, roles and responsibilities.*

Name	Title	Project Role	Project Responsibility
Contractor Staff			

Agency Staff, Roles and Responsibilities

Name	Title	Project Role	Project Responsibility
MDT Staff			
Doug McBroom	Multimodal Programs Bureau Chief	Project Sponsor	A, C, D, H
Hal Fossum	Economist	Lead Business SME	A, B, C, D, E, F, G, H
John Kimball	ISD Project Manager	IS Oversight	A, B, C, D, E, F, H

Name	Title	Project Role	Project Responsibility
MDT Staff			
Miles Wacker	Computer Systems Analyst	Technical Lead, GIS SME	A, C, E, F, G, H
Carol Strizich	Special Studies Section Supervisor	Project Oversight, Business SME	A,C,D,H
Jack Dartman	App 3 Supervisor	Technical Project Oversight	A, C, D
Nick Brown	Economist	Business SME	A, C, G
Chris Dorrington	Data & Statistics Bureau Chief	Business SME, Data Integration,	A, C, D
Ed Ereth	Supervisor Road Inventory & Mapping	Business SME, Data Integration, Oracle	E, C, G
Jack Foster	CSA	Technical SME, Oracle, TIS TE	E, G

***A**: Agency Representative that will participate in determining the success of the Proof of Concept (simple majority) portion of the project, including the initial web service implemented to acquire court disposition data.*

***B**: Agency Representative that will have day-to-day decision-making authority, including approval of changes, reporting, documentation, and deliverables.*

***C**: Agency Representative that will participate in determining the overall project success or failure.*

***D**: Agency Representative that will participate in decisions impacting project cost and/or time.*

***E**: Agency Representative that will participate in deployment.*

***F**: Agency Representative that will participate in development and implementation of solution (web service analytical results).*

G: *Subject Matter Expert*

H: Agency representatives on the project change board.

Composition of Agency Project Participants

Project Manager - A project manager will be assigned to represent the Agency and provide a single point of contact between the Agency and the Contractor.

Project Team – The role of the project team will be to participate in goal setting, defining the scope of the project, provide business process knowledge, provide technical expertise and actively participate in project activities and meetings.

Business Subject Matter Experts - These are business personnel from various Agency departments; particularly knowledgeable on MDT business processes and business requirements.

Technical Subject Matter Experts – A team of technical experts will be involved in the technical duties that come with an implementation. Examples include a Technical Lead for system administration, database administration, web administration, software patches, etc.

2.3 Responsibilities by Phase

Function	Workgroup/Individuals	Primary Responsibility	Approval Criteria
Project Plan and Schedule	Contractor or contractor team has the primary role. *Key Participant(s):* Business SME (BSME) Computer Systems Analyst (CSA) Agency Project Manager (APM) Project Sponsor (PS)	• Develop a consensus project plan and schedule. This will become the baseline project plan and schedule. (C) • Maintain and update the project plan. (C) • Initiate bi-weekly progress status reports and schedule updates to the APM. (C) • Provide input as required. (APM, BSME, and CSA)	Consensus plan and schedule approved by APM and PS

Function	Workgroup/Individuals	Primary Responsibility	Approval Criteria
Requirements Review	Contractor or contractor team has the primary role. *Key participants:* Business SME (BSME) Computer Systems Analyst (CSA) Agency Project Manager (APM) Project Sponsor (PS)	• Coordinate with APM and PS for meeting rooms for JAD sessions. (C) • Review and confirm business requirements. (C) • Update business requirements documentation (C) • Develop requirements Traceability Matrix include user acceptance criteria. (C) • Provide input as required. BSME, and CSA)	Requirements Traceability Matrix is approved by MDT team. Approval by APM and PS
Systems Design	Contractor or contractor team, has the primary role *Key Participant(s):* Business SME (BSME) Computer Systems Analyst (CSA)	• Develop, document and secure approval for the system design. (C) • Participate in design reviews and provide input as required. (BSME, and CSA) • Update requirements as needed. (C)	The design passes the design reviews. Approval for System Design by APM and PS
Build and Test	Contractor or contractor team has the primary role *Key Participant(s):* Business SME (BSME) Computer Systems Analyst (CSA)	• Program the design, provide code for code reviews, and secure approval for content and confirmation to Agency standards for coding. (C) • Develop the Summary-level Test Plan. (C, APM, BSME, and CSA) • Execute QA Test per plan. (C,	Code passes code reviews. No bugs remain

Function	Workgroup/Individuals	Primary Responsibility	Approval Criteria
		BSME, and CSA) • Execute System Testing per plan. (C, BSME, and CSA) • Execute UAT per plan. (C, BSME, and CSA)	No bugs remain No bugs remain Approval by APM and PS
Implementation	CSA primary role *Key Participant(s):* Business SME (BSME) Computer Systems Analyst (CSA)	• Install in production environment (CSA) • Execute post-implementation testing. (C, BSME, and CSA) • Secure acceptance / sign off for the user acceptance test results. (C)	Approval by APM and PS
Transition	Contractor or contractor team, primary role Key Participants: *Key Participant(s):* Business SME (BSME) Computer Systems Analyst (CSA) Agency Project Manager (APM) Project Sponsor (PS)	• Develop the training materials and provide user training. (C)	Training is completed and user guide and system manual are delivered to MDT. Approval by APM and PS
Final Acceptance	Contractor or contractor team, primary role	• Continue to test the application (BSMEs and CSA) • Provide 90 day post UAT support	

Function	Workgroup/Individuals	Primary Responsibility	Approval Criteria
	Key Participants: Business SME (BSME) Computer Systems Analyst (CSA) Agency Project Manager (APM) Project Sponsor (PS)	/ warranty for bug fixes. • The vendor will respond to bugs reported within twenty-four (24) hrs. of receipt of problem report. (C) • Completion of a 90 day warranty period.	No outstanding bugs remain. Approval by APM and PS

3.0 Key Assumptions

- Contractor project staff may not be dedicated full time to the project; however those staff resources that are identified will be sufficient to meet work schedule.
- The Contractor schedule includes adequate notification of deliverable reviews such that acceptance of deliverables may be achieved within the identified review period.
- Contractor deliverables will be of sufficient completeness and quality such that no more than one review cycle will be required.
- A deliverable approval process with formal signature signoffs by the Agency Project Manager and project sponsor will be required.
- Minor schedule fluctuations of specific tasks within the project timeline are anticipated and can occur without a change request being issued as long as the overall project schedule is not impacted.
- The project schedule may be contingent upon the timely completion and/or attainment of external milestones that are outside the control of the Agency and/or the Contractor.
- Circumstances may necessitate changes to the tasks and/or time estimates, at which point the Contractor and the Agency will discuss these changes in good faith at their earliest opportunity.
- Key MDT project team resources will be committed to the project, as appropriate based upon current phase, schedule, and task, as of the project start date.

- The Agency will have all of the appropriate business personnel or their knowledgeable back-up at all of the JAD meetings for the purpose of defining the requirements of the system.
- The Agency will make appropriate IT technical resources available to Contractor staff in a timely manner.
- Should the Agency fail to make resources available per schedule, the schedule will slide accordingly with no penalty accrued by the Contractor.
- The Agency's staff will commit to review standard deliverables in 5 working days. The State reserves the right to extend the deliverable review time up to 10 days on complex deliverables.
- The Contractor is not responsible for modifications to any MDT internal systems required to implement the program.
- The Contractor will include any required 3rd party services in their cost proposal.
- If it is determined that business critical data elements are not noted, and that those data elements are required before the program can be implemented, the changes will need to go through the change request process.
- The following information technology services are not included in this Statement of Work for the Contractor: network connections; telecommunications network(s); operating system, network and database administration; disaster recovery planning; the acquisition, installation, testing and tuning of any required hardware, peripherals and communications infrastructure.
- Data necessary to complete the network analysis and other economic modeling is available in the MDT environment.
- Installation, implementation, and deployment will be undertaken by MDT operations upon the completion of the HEAT2 Build. Upon successful user acceptance testing, the system will be available at production-level without unnecessary constraint of processing power and memory.

4.0 Risks

Risk	Mitigation Strategy
Availability of key stakeholder resources	Making project schedule and timelines available to all stakeholders; establish meeting schedules as far in advance as possible.
Participation by subject matter experts	Establishment of schedules that identify when SME's will be needed.
Establishing HEAT2 platform environments	The System Design will contain the technical architecture, defining access and physical components of the system. MDT will use this to plan and create the deployment environment during the build phase.
MDT Systems resource constraints to assist implementation of the HEAT2 build for user acceptance testing and/or production.	Ongoing communication to ensure commitment to consensus timelines can be met by MDT ISD Systems. Ensure management of ISD Systems understands and supports the effort.
MDT System Accessibility	Engage MDT ISD Management and establish rules and mechanisms that support the needed systems. Ensure the security requirements have been reviewed with MDT Systems.
Cost Overruns	The project will utilize a formal change management process, identifying and analyzing impacts to the project budget as part of the process.

5.0 Project Responsibilities

5.1 Contractor Responsibilities

- Contractor will provide a project manager as a single point of contact for the contractor.
- Contractor will not replace staff members assigned to this project with lesser experienced staff members and replacements cannot be made without Agency approval.
- Contractor will maintain the project overall duration such that exchange Go-Live dates are not delayed, even though Contractor project staff may or may not be dedicated full time to the project.
- Contractor shall provide notification of an imminent deliverable review a minimum of five working days prior to initiating a review cycle.
- Contractor will provide implementation support for HEAT2 deployed within MDT's environment.
- Contractor will provide implementation support for the new web services described or implemented as a result of this statement of work, and any new or existing web services that are called by HEAT2 that are created as a result of this statement of work.
- Contractor will provide all deliverables as specified within this statement of work.
- Contractor will have an on-site presence at MDT for the requirements reviews (JAD sessions), system design reviews, system and user acceptance testing and production testing..
- Contractor staff and MDT staff will collaboratively system and user acceptance test HEAT2.
- Contractor will provide MDT with the working code at a monthly cycle and at major milestones throughout the project.
- The Contractor will actively participate in code reviews.
- The Contractor will deliver bug free code for system and user acceptance testing and implementation.
- Contractor will provide on-site training to MDT (as outlined in this SOW) in a classroom environment suitable for training. The Contractor will be responsible for developing and providing all training materials, including user guides and system guides.

5.2 Agency Responsibilities

- The Agency will designate a Project Manager (PM). The PM will be the Agency's single point of contact.
- The agency will provide desk space to accommodate 2 Contractor staff members. Additional accommodations may be temporarily available by Contractor request.
- MDT will provide resources for project tasks when noted on the project schedule.
- MDT will purchase all hardware and software necessary for implementation.
- MDT will be responsible for installing and configuring the physical inventory required to establish and maintain MDT's SOA infrastructure. The Contractor's cost estimates need not include installation and/or configuration of any computer hardware and/or components of the network or SOA infrastructure.
- MDT will be responsible for providing a training facility for the Contractor's use for MDT training.
- System, server, and workstation backups are the responsibility of MDT. This includes the development and execution of the system backups and recovery programs.
- MDT personnel will perform and assume the responsibility for applying software patches that are not intrinsic to HEAT2 System.

6.0 Scope of Work

Contractor will provide system analysis, system design, programming, and test services to fully implement the HEAT2 program. System and user acceptance testing will include joint test activities by the Contractor and Agency staff. Following user acceptance testing, the Agency and Contractor will fully test the implementation according to the test plans.

Contractor Activities:

- Requirements Review sessions (JAD)
- Completion of System Design & Analysis
- HEAT2 Build
    - HEAT2 Network Construction Module
    - Scenario Creation & Editing Module
    - Network Assignment Module
    - Network Accessibility Module
    - User Benefit Module

- Cost Estimation Module
- Business Attraction Module
- Visitor Attraction Module
- REMI Interface
- Benefit/Cost Analysis Module

- HEAT2 Testing & Deployment

6.1 Requirements Review

The Contractor, in conjunction with the Agency, will conduct formal requirements review sessions to validate the requirements.

6.2 Completion of System Design

Completion of the Technical System Design document by the Consultant will build upon system design effort undertaken by MDT prior to assignment of the Contract. The Technical System Design document provided will serve as the starting point for the consultant. Esri Consulting has reviewed the original HEAT program, has provided MDT with system design recommendations and this will also be available to the Contractor.

The goal of the System Design effort will be to define the components, processing requirements, system architecture, data requirements, and identification of the technology used in both the user interfaces, geoprocessing, and model output interfaces.

The methodology used to design each module will be iterative in nature, each module design effort will follow the same steps to ensure that the program requirements are identified and satisfied by the design. The detailed design will be developed using information gathering in Joint Application Design (JAD) sessions with key stakeholders.

When the technical system design has been completed, any gaps in the proposed solution will be identified and project documents will be updated by conducting a design review.

The System Design review's purpose is to demonstrate to the system owner and customers that the design can be implemented and it accounts for all software and data requirements within the design constraints. The design review will include a validation of the algorithms necessary to complete HEAT2. The System Design review can take place with several short JAD meetings or with one long working session.

Contractor Deliverables for System Design & Analysis

- Technical System Design
- Updated Requirements

- Requirements Traceability Matrix
- Updated Project Plan

6.3 HEAT2 Build

The build of HEAT2 will commence immediately following MDT acceptance of the Technical System Design. The bulk of the coding will take place for each of the HEAT2 modules described below.

6.3.1 HEAT2 Network Reconstruction Module

The goal of the Network construction module is to recreate the HEAT2 network used for analysis from dynamic MDT data sources housed in the Oracle Database. The end user will be able to initiate the Network Reconstruction. The HEAT2 Network is the basis for further analysis within the program.

6.3.2 Scenario Creation and Editing Module

The scenario creation and editing module provides the user with an interactive map and tools within a user interface to create and edit scenarios based upon the MDT road network. Each scenario recreates the network with the modification to the roadway that would take place during a specific project or set of projects. Scenario management also takes place within this module. Scenarios will be stored and retrieved, allowing the end-user to re-use and modify previously completed scenarios.

6.3.3 Network Assignment Module

The goal of the network assignment module is to assign traffic volumes to the scenario roadways and as-is network if necessary. The analysis is based upon an Origin-Destination cost matrix.

6.3.4 Network Accessibility Module

The goal of the network accessibility module is to analyze the changes in travel times from each transportation analysis zone (TAZ) to various facilities and markets as a result of a highway improvement scenario, changes to accessibility form the basis for the following modules.

6.3.5 User Benefit Module

The user benefit module determines the difference in monetary terms from the as-is roadway network to the improvement scenario. The user benefit module will utilize REMI through the interface describe later in this section. The module will quantify the monetary differences between the as-is and scenario networks by quantifying the costs of travel, operation costs of highway, accidents, and reliability. The impacts are further broken down by truck travel, business auto trips and non-business travel.

6.3.6 Cost Estimation Module

The cost estimation module will utilize the Preliminary Estimation Tool. It is intended to calculate the costs of the highway investment scenario. The cost estimates are entered by the user for the improvement project

depicted by the scenario. Standard estimates of inflation are considered within the PET spreadsheet. The PET will be wrapped with a façade or similar method to produce a service that will be consumed by HEAT2.

6.3.7 Business Attraction Module

The goal of the business attraction module is to estimate on an industry by industry basis the job impacts due to increased accessibility provided by highway improvement scenarios.

6.3.8 Visitor Attraction Module

An optional module designed to be used when a highway improvement is likely to result in increased tourism. The visitor attraction module allows the end user to enter the number of new visitors that are expected to be attracted to each county due to the highway investment.

6.3.9 REMI Interface

The REMI interface prepares the inputs for the REMI program based on HEAT2 modules, executes the REMI processing, and deals with the outputs. There are several modules the will utilize this interface.

6.3.10 Economic Output Module

The Economic Output Module performs the Benefit/Cost analysis and represents the final stage of the HEAT2 program. The BC takes inputs from the Cost Estimation module and REMI Interface in order to perform the final BC analysis for the highway improvement scenario. The BC Analysis module will also perform what was termed the REMI Impact Analysis within the original version of HEAT, which is it will pass an input to the REMI Interface and utilize the results from REMI combined with the Cost Estimation in order to produce the final BC numbers. The module will deliver the final outputs of HEAT in both ArcGIS and Excel compatible formats.

Deliverables for HEAT2 Build

- Code Delivery
- Code Review and Approval.
    - Code Review Criteria
        - Source Control
        - Naming Convention and Coding Style
        - Maintainability
        - Logic
        - Redundant Code
        - Performance
        - Security

- Scalability
- Functional Issues
- Error Handling
- Reusability

All of the code will be delivered to MDT at a designated schedule to be determined during the System Analysis phase. This may be done in a variety of ways not limited to using methods such as GitHub. Part of the requirements for this system is that all of the source code will be open.

The Contractor is not responsible for modification and deployment within MDT Systems required to implement the solution. With system modification identified as a serious risk to the successful implementation of HEAT, solutions outside of the MDT environment will be considered, such as deployment on a PAAS (Platform As A Service) provider if HEAT2 will not implement in time to meet the scheduled project completion.

6.4 HEAT2 Testing & Deployment

6.4.1 Internal QA Testing

The Contractor will be responsible for Internal QA Testing. Internal QA testing will take place in the contractor environment and through access granted to Contractor to MDT's Test environment.

Contractor will prepare test cases and transactions for the purposes of the Internal QA Testing.

6.4.2 System Testing

Upon completion of the Internal QA Testing the code-line will be deployed to MDT's TEST environment where the HEAT2 program will be tested end-to-end.

The Agency will be responsible for System Testing. System Testing will include end-to-end testing that will demonstrate the ability to successfully complete a scenario.

Once the System Testing is successfully executed, User Acceptance Testing can start. The contractor will provide a bug-free product for user acceptance testing. User Acceptance Testing cannot begin until all known bugs have been resolved.

6.4.3 User Acceptance Testing

Contractor and MDT staff will collaboratively write a User Acceptance Test Plan document.

The Agency will be responsible for leading User Acceptance Testing. User Acceptance Testing will involve the testing of the highway scenarios by MDT to validate that the program is functioning properly. User Acceptance Testing will be based upon test cases developed by MDT. Test cases must be based upon in-

scope functionality and requirements. Contractor will review the test cases for the limited purpose of validating that the test cases reflect in-scope functionality.

Contractor will be responsible for remediation of defects in the program. MDT will be responsible for remediation of defects in the external systems that feed the program.

The Agency will provide a defect tracking tool to record defects, assign responsibility for investigation and/or mitigation, record progress and record status for the Contractor. The Contractor may use their tracking tool if acceptable to the Agency.

If needed, MDT will facilitate teleconferences to review the status and progress of the User Acceptance Testing.

Once the User Acceptance Test is successfully executed, by the mutual agreement of the Agency and the Contractor, the system can be deployed for production use.

Contractor Activities and Deliverables for HEAT2 Testing

- Updated Requirements Traceability Matrix
- Collaborative User Acceptance Test Plan
- Participation in user acceptance testing
- Remediation of program defects (bugs)
    -
    - Defects are defined as follows:
        - Critical - the program does not function
        - High priority – the program functions, but returns incorrect results
        - Low priority – the program functions and returns the correct answers, but there is a formatting or spelling issue
- During testing in any phase, the Contractor will respond to reported bugs within 24 hours (1 working day).

6.5 Inclusions

Tasks to be performed under this SOW include:

- Confirmation of Requirements
- Contractor completion of System Design

- Contractor completion of System Test Plan.
- Contractor completion of HEAT2 Build
- MDT will provide all roadway information from internal systems including a HEAT2 transportation network capable of executing the network analysis functionality.
- MDT will provide access to and storage of GIS datasets and tabular information used by the HEAT2 program.

6.6 Exclusions

The following tasks are considered out of the scope of this project

- Data development beyond what is currently available.
- Database redesign of existing MDT systems such as TIS (Transportation Information System)
- Modification and analysis of the current economic modeling.
- Agency system modification
- Software enhancement to package beyond off the shelf capability, specifically to ArcGIS Desktop and Server, Microsoft Excel, and REMI.

6.7 Deliverables

Deliverables provided by the Contractor will include:

1.) The documents required by this SOW are:
    a. Project Plan document
        i. Risk Management
        ii. Communication Plan
        iii. Resource Management
        iv. Project Schedule
    b. Technical System Design document
        i. Including completed design driver by MDT requirements
        ii. Considers Esri System Design Recommendations
    c. Test Plans
        i. System Test Plan, with MDT participation
        ii. User Acceptance Test Plan, with MDT participation
    d. Bi-weekly Status Reports

2.) The functioning HEAT2 program
    a. Code Delivery & Deployment
        i. Documentation of Code, i.e. Java Docs or similar for all classes, methods and object relation models.
        ii. Code delivery checked into MDT Repository and/or shared on GitHub or similar.

b. Users Manuals done in conjunction with MDT

6.8 Milestones

- Approval of the project plan within 2 weeks of Contractor staff on site.
- Approval of the requirements document
- Approval of the system design
- Approval of the system test plan
- Approval of the HEAT2 Build
- Approval of the user test plan
- Approval of user acceptance testing
- Completion of the warranty period

7.0 Work Approach

- This project will use the PMBOK (Project Management Body of Knowledge) based methodology.
- A formal change process will be used.
- A formal decision request process will be employed.
- A formal approval process will be employed for deliverables and milestones.

8.0 Deliverable and Milestone Approvals

- Deliverable and milestone completions require formal signature approval from the MDT Project Manager and MDT Project Sponsor.

9.0 Final Acceptance

- Final acceptance at the end of the warranty period requires formal MDT Project Manager and MDT Project Sponsor.
- The Contractor will have met all user acceptance testing requirements, exhibited a successful migration and deployment in the MDT production environment, and completion of the warranty period with no outstanding critical, high priority or low priority bugs remaining.
- The State has the right to extend or terminate this SOW at its sole discretion.

10.0 Warranty Phase

The warranty period is 90 days and begins following successful production deployment and implementation testing with no bugs remaining. The warranty period begins when all known bugs have been fixed.

11.0 Schedule

The Contractor will develop a consensus, formal project schedule within two weeks following the kick off meeting. The Contractor will maintain this project schedule and will measure their performance against this schedule. The schedule will updated appropriately with scope change impacts.

12.0 Project Status Reporting

The Contractor will provide bi-weekly (every two weeks) project status reports, submitted to the MDT Project Manager. This status report will provide at a minimum:

1. A summary of overall project health;
2. Tasks, deliverables and milestones completed since the prior status report
3. Tasks, deliverables and milestones scheduled to complete since last report, but did not complete
4. Outstanding issues, action item reporting, and pending decisions
5. Updated project schedule

13.0 State Policies Standards and Computing Environment

State Policies, Standards and Computing Environment can be found on the state Web site at:

Environment - http://itsd.mt.gov/techmt/compenviron.mcpx

Policies - http://itsd.mt.gov/policy/default.mcpx

Accepted software products - http://itsd.mt.gov/policy/software/default.mcpx

14.0 Timeline and Period of Performance

The period of performance for this project, which imposes a requirement of a successful outcome for the various phases defined below. Required deliverables and training shall also be provided within the timeframes established by their respective periods of performance within each phase.

Period of Performance		
Phase	Starting Date	Ending Date
Requirements Validation (Phase 1)	TBD pending acceptance of a project schedule	**TBD**

System Design Phase (Phase 2)	TBD pending acceptance of a project schedule	**TBD**
Development Phase (Phase 3)	TBD pending acceptance of a project schedule	**TBD**
Testing & Acceptance Phase (Phase 4)	TBD pending acceptance of a project schedule	**TBD**

15.0 Compensation

This project has a fixed budget and the State may reject any proposal exceeding the budgeted amount.

All invoices must provide details of the activities, milestones, or deliverables being billed for.

Retention of ten (10) percent will be withheld from each invoice payment and the total of the amounts retained will be released upon final acceptance.

Agency shall pay the Contractor an amount not to exceed <TBD> dollars <$xx,000.00> for the performance of all activities necessary for or incidental to the performance of work as set forth in this SOW. The compensation for services rendered shall be paid as follows:

16.0 Payment Schedule

The total contract amount will be divided into the following payments based upon a phased delivery.

Requirements Validation (Phase1)	10%
System Design Phase (Phase 2): System Design, System Test Plan.	25%
Development Phase (Phase 3): Completion of HEAT Build	30 %
Testing & Acceptance Phase (Phase 4): Completion of System Test, User Acceptance Testing and successful System Deployment Testing.	25%
Holdback based on warranty phase (Phase 5)	10%

- Deliverable or milestone approval forms must accompany all invoices.
- The deliverables and milestone completions will be validated, approved and signed off by the MDT project manager and sponsor prior to invoice payments.
- Invoices for change orders will identify the change order number, title description, roles, rates and activities.
- Contractor will be responsible for all Contractor-related travel expenses.
- Contractor invoices will be paid within 30 days of Contractor invoice receipt by the Agency project manager.
- All costs associated with the Contractor's third-party vendors shall be included in the Contractor's proposal.

17.0 Additional terms and conditions specific to this SOW

17.1 Civil Rights – Non-Discrimination Notice

During the performance of this Agreement, Computer Consulting Corporation (hereafter in this Section "the Party"), for itself, its assignees and successors in interest, agrees as follows:

A. COMPLIANCE WITH TITLE VI OF THE CIVIL RIGHTS ACT OF 1964 FOR FEDERAL-AID CONTRACTS

1. Compliance with Regulations: The Party shall comply with all Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation, 49 Code of Federal Regulations, Part 21, as they may be amended (hereafter referred to as the Regulations), which are incorporated by reference and made a part of this Agreement, even if only state funding is here involved.

2. Nondiscrimination: The Party, with regard to the work performed by it during the Agreement, shall not discriminate on the grounds of sex, race, color, or national origin in the selection and

retention of subcontractors, including procurement of materials and leases of equipment. The Party shall not participate either directly or indirectly in the discrimination prohibited by 49 CFR 21.5.

3. Solicitations for Subcontracts, Including Procurement of Materials and Equipment: In all solicitations, whether by competitive bidding or negotiation by the Party for work to be performed under a subcontract, including procurement of materials or leases of equipment, any potential subcontractor or supplier shall be notified by the Party of the Party's obligations under this Agreement and the Regulations relative to nondiscrimination.

4. Information and Reports: The Party will provide all reports and information required by the Regulations, or directives issued pursuant thereto, and permit access to its books, records, accounts, other sources of information and its facilities as may be determined by State or the Federal Highway Administration (FHWA) to be pertinent to ascertain compliance with Regulations or directives. Where any information required of the Party is in the exclusive possession of another who fails or refuses to furnish this information, the Party shall so certify to the Department or the FHWA as requested, setting forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of the Party's noncompliance with the nondiscrimination provisions of this Agreement, State may impose sanctions as it or the FHWA determines appropriate, including, but not limited to,

a. Withholding payments to the Party under the Agreement until the Party complies, and/or

b. Cancellation, termination or suspension of the Agreement, in whole or in part.

6. Incorporation of Provisions: The Party will include the provisions of paragraphs (1) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations or directives issued pursuant thereto. The Party will take such action with respect to any subcontract or procurement as the State or the FHWA may direct to enforce such provisions including sanctions for noncompliance: Provided, however, that in the event the Party is sued or is threatened with litigation by a subcontractor or supplier as a result of such direction, the Party may request the State to enter into the litigation to protect the interests of the State, and, in addition, the Party or the State may request the United States to enter into such litigation to protect the interests of the United States.

B. COMPLIANCE WITH THE MONTANA GOVERNMENTAL CODE OF FAIR PRACTICES, §49-3-207, MCA

In accordance with Section 49-3-207, MCA, the Party agrees that for this Agreement all hiring will be made on the basis of merit and qualifications and that there will be no discrimination on the basis of race, color, religion, creed, political ideas, sex, age, marital status, physical or mental disability, or national origin by the persons performing the Agreement.

C. COMPLIANCE WITH AMERICANS WITH DISABILITIES ACT (ADA)

The Party will comply with all regulations relative to implementation of the AMERICANS WITH DISABILITIES ACT.

The Party will incorporate or communicate the intent of the following statement in all publications, announcements, video recordings, course offerings or other program outputs: "The Party will provide reasonable accommodations for any known disability that may interfere with a person in participating in any service, program or activity offered by the Party. In the case of documents, recordings or verbal presentations, alternative accessible formats will be provided. For further information call the Party."

All video recordings produced and created under contract and/or agreement will be closed-captioned.

D. COMPLIANCE WITH PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES IN DEPARTMENT OF TRANSPORTATION FINANCIAL ASSISTANCE PROGRAMS, 49 CFR §26

Each Agreement the Department signs with a Party (and each subcontract the prime contractor signs with a subcontractor) must include the following assurance:

The Party, sub recipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Party shall carry out applicable requirements of 49 CFR part 26 in

the award and administration of DOT-assisted contracts. Failure by the Party to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate.

_____ Date: _____

Civil Rights

Execution/Signature Block

In Witness Whereof, the parties hereto, having read this SOW [*Project Name]* to Contract Number *[XXX-XXX-XXX]* in its entirety, do agree thereto in each and every particular.

The contractor is notified that pursuant to 2-17-514, MCA, the Department of Administration retains the right to cancel or modify any contract, project or activity that is not in compliance with the Agency's Plan for Information Technology, the State Strategic Plan for Information Technology, or any statewide IT policy or standard.

Reviewed and Approved by:

State Information Technology Services Division

Montana Department of Administration,

Per MCA 2-17-512:

_____ Date: _____

CIO (or Agency Designee for Delegated IT Authority)

Reviewed and Approved by:

Information Services Division

Montana Department of Transportation

<Contractor>

Signature/ Date	Signature/Date
Print or Type Name	Print or Type Name
Title:	Title: